

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In the Application of

Takahiro FURUTANI et al

Application No.: 10/518,452

Filed: December 20, 2004

For: PIGMENTED INK COMPOSITION

Confirmation No.: 7850

Group Art Unit: 1714

Examiner: Callie E. Shosho

DECLARATION OF TAKUO MIZUTANI UNDER 37 C.F.R. 1.132

Commissioner for Patents
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I, Takuo MIZUTANI, a citizen of Japan, c/o Hitachi Maxell, Ltd., 1-88, Ushitora
1-chome, Ibaraki-shi, Japan, declare and say as follows:

1. I received a Mater Degree from the Graduate School of University of Tsukuba,
Faculty of Chemistry in March 2001,

2. Since April 2001 to the present, I have been employed by Hitachi Maxell, Ltd.
and engaged in the research works on the development of pigmented inks.

I read the Office Action issued on September 11, 2007 in the above identified
application and the prior arts cited therein. Then, I carried out additional experiments
(Experiments I, II and III) for showing the superiority of the invention claimed in the
above identified application from the inventions of the prior arts cited. I beg to report
the results of the experiments below together with the results reported in my previous
declaration of June 12, 2007.

EXAMPLE 1

(cited from the specification of the above identified application)

In a 100 cc plastic bottle, 4 parts of a copper phthalocyanine blue pigment ("FASTOGEN BLUE GNPS" available from Dainippon Ink and Chemicals Incorporated), 4 parts of Dispersant A [copolymer of styrene/methacrylic acid/butyl acrylate/butyl methacrylate/polyether macromonomer ("PME 400" available from NOF Corporation) (weight ratio of 20/10/30/30/10), acid value: 65 mg-KOH/g, weight average molecular weight : 6.0×10^4 , molecular weight dispersion: 3.2], 12 parts of diethylene glycol monobutyl ether monomethyl ester (boiling point: 247°C) as an organic solvent and 100 parts of zirconia beads having a diameter of 3 mm were weighed and charged, and the mixture was dispersed for 2 hours with a paint shaker (available from TOYO SEIKI KOGYO CO., LTD.).

After dispersing, the mixture was diluted with diethylene glycol monobutyl ether monomethyl ester to obtain Pigmented Ink Composition A containing 5% by weight of the pigment and 5% by weight of Dispersant A.

COMPARATIVE EXPERIMENT 1

(using a solvent having a boiling point of lower than 150°C)

Pigmented Ink Composition J of this Comparative Experiment was prepared in the same manner as in Example 1 except that ethylene glycol monomethyl ether monomethyl ester (boiling point of 145°C) in place of diethylene glycol monobutyl ether monomethyl ester (boiling point: 247°C). Ink Composition J contained 5% by weight of the pigment and 5% by weight of Dispersant A.

COMPARATIVE EXPERIMENT 2

(using a resin other than an acrylic resin as a dispersant)

Pigmented Ink Composition K of this Comparative Experiment was prepared in the same manner as in Example 1 except that Dispersant A was replaced by a polyester resin base dispersant (SOLSPERSE® 32000 available from the Lubrizol Corporation)

(Dispersant H). Ink Composition K contained 5% by weight of the pigment and 5% by weight of Dispersant H.

EXPERIMENT I

(using a solvent having a boiling point close to the lower limit of the boiling range claimed)

Pigmented Ink Composition L of this Experiment was prepared in the same manner as in Example 1 except that ethylene glycol monoethyl ether monomethyl ester (boiling point: 156°C) in place of diethylene glycol monobutyl ether monomethyl ester (boiling point: 247°C). Ink Composition L contained 5% by weight of the pigment and 5% by weight of Dispersant A.

EXPERIMENT II

(using a resin having an acid value close to the upper limit of the acid value range claimed)

Pigmented Ink Composition M of this Experiment was prepared in the same manner as in Example 1 except that Dispersant A was replaced by Dispersant I [copolymer of styrene/acrylic acid/butyl acrylate/PME 400 (weight ratio of 8/37/20/35); acid value: 288 mgKOH/g; weight average molecular weight: 5.4×10^4 ; molecular weight distribution: 2.6]. Ink Composition M contained 5% by weight of the pigment and 5% by weight of Dispersant I.

EXPERIMENT III

(using a resin having an acid value close to the lower limit of the acid value range claimed)

Pigmented Ink Composition N of this Experiment was prepared in the same manner as in Example 1 except that Dispersant A was replaced by Dispersant J (copolymer of: styrene/acrylic acid/butyl acrylate/PME 400 (weight ratio of 43/2/20/35); acid value: 15 mgKOH/g; weight average molecular weight: 3.6×10^4 ; molecular weight

distribution: 2.3). Ink Composition N contained 5% by weight of the pigment and 5% by weight of Dispersant J.

Water resistance, cockling, antigrazing and printed layer-sliding were measured or evaluated by the methods described in the specification of the above identified application.

In addition, with Ink Compositions A to E of Examples 1-5, Ink Compositions F and G of Comparative Examples 1 and 2, Ink Compositions H and I of Reference Examples 1 and 2, and Ink Compositions J, K, L, M and N of Comparative Experiments 1 to 5, a drying property of the ink compositions was also evaluated as follows:

Drying Property:

Using an ink-jet printer (MJ-510C available from EPSON), a gradation test pattern (100, 80, 60, 40 and 20) was continuously printed on five sheets of gloss paper (SUPER PHOTO GLOSS PAPER available from Hitachi Maxell) with a pigmented ink composition at a temperature of 20 to 25°C and a relative humidity of 40 to 60%. After the ink jet printer was kept standing under the same conditions for 24 hours, the same gradation test pattern was printed. When no stuck pixel appeared in the latter, the ink composition was ranked "A", while if stuck pixels appeared, the ink composition was ranked "B".

The results of the above experiments are summarized in Table A, which also includes the results in Table 1 in page 19 of the specification of the above identified application.

Table A also includes the boiling points (b.p.) of the solvents and the acid values of the resins.

Table A

	Pigmented ink composition	b.p. of solvent	Acid value of resin	Water resistance	Cockling	Anti-grazing	Sliding test	Drying property
Ex. 1	A	247	65	A	A	A	A	A
Ex. 2	B	247	77	A	A	A	A	A
Ex. 3	C	247	24	A	A	A	A	A
Ex. 4	D	247	65	A	A	A	A	A
Ex. 5	E	270	65	A	A	A	A	A
Comparative Example 1	F		8	A	A	B	B	A
Comparative Example 2	G	247	0	A	A	B	B	A
Reference Example 1	H	247	65	A	A	B	B	A
Reference Example 2	I	247	65	A	A	B	B	A
Comparative Experiment 1	J	145	65	A	A	A	A	B
Comparative Experiment 2	K	247	65	A	A	B	B	A
Experiment I	L	156	65	A	A	A	A	A
Experiment II	M	247	288	A	A	A	A	A
Experiment III	N	247	15	A	A	A	A	A

As can be seen from Table A, Ink Composition J comprising a solvent having a boiling point of lower than 150°C had the inferior drying property to Ink Compositions A to I and K. This is because Ink Composition J comprising the solvent having a boiling point of lower than 150°C dried very quickly so that some nozzles of the printing head were clogged and thereby stuck pixels appeared.

Ink Composition K had inferior antigrazing and sliding properties, since it contained the polyester resin as a dispersant instead of an acrylic resin.

Experiments I, II and III show that the effects of the invention claimed in the above identified application are achieved, when the boiling point of the solvent and the acid value of the resin used as a dispersant are within the boiling point range and the acid value range claimed in the above identified application.

The undersigned declares further that all statements made herein of this own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so that made are punishable by fine or imprisonment, or both, under 18 U.S. Code 1001 and that such willful false statements may be jeopardize the validity of this application or any patent issuing thereon.

Takuo Mizutani

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Dated this 17th day of December, 2007